



CANGO Telematic Interface

User Guide (rev17022011)

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Related Documents

SAE J1939 / 71 Vehicle Application Layer Clarification of FMS data
 SAE J1708
 SAE J1587

Notation of special characters

[CR] Enter key or character code carriage return (0x0D) – if you will use Hercules you must type: \$0D
 [LF] character code linefeed (0x0A)
 [BELL] character code bell (0x07) – if you will use Hercules you must type: \$07

Version History		
Edition	Date	State
10082010	April 2010	1 st edition
17022011	February 2011	2 nd edition: New features/paragraphs: <ul style="list-style-type: none"> • 5.3 General Considerations about Configuration Mode • 5.16 GP Command • 5.17 GS Command • 5.18 JF Command • 5.19 JD Command Updated features/paragraphs <ul style="list-style-type: none"> • 5.6 F Command (F4, F5, F6, F7) Minor content updates (screenshots, explanations, examples) throughout the document.

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1. PRODUCT PHILOSOPHY

CANGO Telematic Interface is a smart platform that can power-up your telematic solution with the ability to connect to the CANbus, J-Bus or K-Line of most important trucks, cars and equipments.

Because of the flexible hardware design and the options to setup the software, the device can be used in multiple ways and designed for specific requirements.

The input of CANBUS Telematic Interface can be:

- CANbus (standard), part no. 22646-4-X01
- J-Bus (option), part no. 22646-4-X02
- K-Line (option), part no. 22646-4-X03

The output of CANbus Telematic Interface can be:

- the serial – pure ASCII code, making the device and the delivered data handling very easy. You only have to interpret the ASCII data in the received serial strings following the manual instructions;
- CANbus FMS standard.

Once you made the configuration through the serial link, the CANGO Telematic Interface will keep the pre-programming because all data are stored in the internal non volatile memory.

The serial link of the CANGO Telematic Interface supports baud rates from 2.400 up to 115.200 baud.

2. SUPPORTED TRUCKS & EQUIPMENTS

This version of CANGO Telematic Interface firmware support following trucks & equipments:

Cars	Hardware interface type	Standard
Dacia Logan	K-Line	proprietary
Dacia Sandero	K-Line	proprietary
Dacia Duster	K-Line	proprietary
Renault*	CAN (J2284)	proprietary
* Please inquire about all Renault supported cars		
Trucks	Hardware interface type	Standard
Generic truck/engine	CAN	J1939
DAF LF, CF, XF	CAN	J1939/FMS Truck
ERF ECX	CAN	J1939/FMS Truck
IVECO Eurocargo, Stralis	CAN	J1939/FMS Truck
MAN TGL, TGA, TGX	CAN	J1939/FMS Truck
MERCEDES Actros, Axor	CAN	J1939/FMS Truck
RENAULT Magnum, Premium	CAN	J1939/FMS Truck
SCANIA 4,P, R	CAN	J1939/FMS Truck
VOLVO FH, FL, FM	CAN	J1939/FMS Truck
PETERBILT	J-BUS	J1708/J1587

KENWORTH	J-BUS	J1708/J1587
STERLING	J-BUS	J1708/J1587
WESTERN STAR TRUCKS	J-BUS	J1708/J1587
FREIGHTLINER	J-BUS	J1708/J1587
INTERNATIONAL TRUCKS	J-BUS	J1708/J1587
VOLVO	J-BUS	J1708/J1587

Buses	Hardware interface type	Standard
DAIMLER BUSES - EvoBus	CAN	J1939/Bus FMS
NEOMAN	CAN	J1939/Bus FMS
SCANIA	CAN	J1939/Bus FMS
VOLVO BUS CORPORATION	CAN	J1939/Bus FMS
IrisBus IVECO	CAN	J1939/Bus FMS
VDL Bus International B.V.	CAN	J1939/Bus FMS

Equipments	Hardware interface type	Standard
Powered by CUMMINS engine	CAN or J-BUS	J1939 or J1708/J1587
Powered by Detroit Diesel engine	CAN or J-BUS	J1939 or J1708/J1587
Powered by DEUTZ engine	CAN or J-BUS	J1939 or J1708/J1587
CATERPILLAR	J-BUS	J1708/J1587

3. HARDWARE DESCRIPTION

3.1 Overview

The CANGO Telematic Interface has/uses a physical layer according to ISO 11898-2(250 Kbit/s), an application layer according to SAE J1939/71 and also a data link layer according to SAE J1939/21 that provides complete J1939: FMS and Bus FMS.

Also CANGO Telematic Interface includes SAE J1708 that defines a serial, bidirectional network to be used in the commercial vehicle industry. The SAE J1587 Standard regulates the communication and standardized data exchange between different ECUs based on SAE J1708 networks.

CANGO Telematic Interface provides complete telematic functionality for mobile tracking applications that integrate J1939, J1939/FMS and Bus FMS from all type of European trucks, equipment and buses; and also integrates J-Bus data's from all American trucks types and Volvo trucks without FMS interfaces. And also equipments powered by Cummins, Caterpillar, Detroit Diesel, Deutz and Vartsila are supported.

3.3 Device interfaces

CANGO Telematic Interface has more types of interfaces to communicate between your hardware and the trucks or equipments.

3.3.1 UART interface

CANGO Telematic Interface includes 2 Universal Asynchronous Receiver Transmitter (UART) serial interfaces. UART 1 (Rx/Tx) is the default. It supports data rates from 2400 to 115200 Bits/s. Also an interface based on RS232 standard levels (+/- 12 V) can be accomplished by using level shifters such as Maxim MAX3232.

Hardware handshake signals and synchronous operation are not supported.

3.3.2 CAN interface

CANGO Telematic Interface includes 2 CAN V2.0A and 2.0B interfaces. One of the CAN interfaces, CAN_1 is used to read only the engine data while the other one, CAN_2 sends the J1939/FMS frames, optional, to be interpreted by Telematic Interface by connecting in the J-Bus.

Both of these CAN interfaces are ISO 11898 compliant.

In standard configuration the CANGO Telematic Interfaces have 2 CANbus ports.

You can order using part no. 22646-4-X01.

3.3.3 J-Bus interface (option)

CANGO Telematic Interface device include the J1708/J1587 interface. For this device configuration use order part no. 22646-4-X02.

3.3.4 K-Line interface (option)

CANGO Telematic Interface device includes one OBD interface using K-Line protocol. This interface is used only for diagnostic and it is made in accordance with the ISO 9141 standard. For this configuration please use order part no. 22646-4-X03.

4. INSTALLATION

After applying the supply voltage the Interface will start-up with these factory default settings:

S1 Display mode
F0 J1939/FMS(0) or J1939/Bus(1) or J1708/J1587->Serial(2) or or J1708/J1587->CAN(3) or K-line->Serial(4) or
K-line->CAN(5) or J2284->Serial(6) or J2284->J1939/FMS(7)
E0 Emulator mode (for FMS only)
V 13052010 Software Version
A1 Autostart mode
M1FFFFFF Filter Mask
U1 Baud rate
I0001 Report interval
X001E Refresh interval
C0 CRC
K0250 Can 1 Baud
L1 Can listen interface 1/2
P1 Can playback interface 1/2

5. CONFIGURATION MODE

5.1 COMMAND OVERVIEW

[BELL][CR]	Enables Configuration Mode
?[CR]	Shows configuration parameters
An[Cr]	Sets Autostart on or off
Mcccccc[CR]	Sets mask to define the output values
R[CR]	Restart from configuration mode / Start when Autostart is off
Sn[CR]	Sets output to screen or table format
Fn[Cr]	Sets current operating automotive standard
Un[CR]	Sets RS232 baud rate
V[CR]	Outputs version information
Icccc[CR]	Setting the time to up-date
Xcccc[CR]	Setting the CAN cycle time buffer
AT_SEND[CR]	Sending only at request
Ln[Cr]	Setting specific CAN interface to listen
Pn[Cr]	Setting specific CAN interface to play

5.2 [BELL] Command – Configuration Mode

Enables the CANGO Telematic Interface to accept Configuration Commands. In Configuration Mode no protocol data are transmitted through the serial link.

Format:
[BELL][CR]

Answer:
Configuration Mode[CR][LF]
Error message on wrong command format.

5.3 General Considerations about Configuration Mode

In order to configure CANGO Telematic Interface, the user should use the commands described below and border them with [BELL] Command at the beginning and Reset Command at the end.

Example:

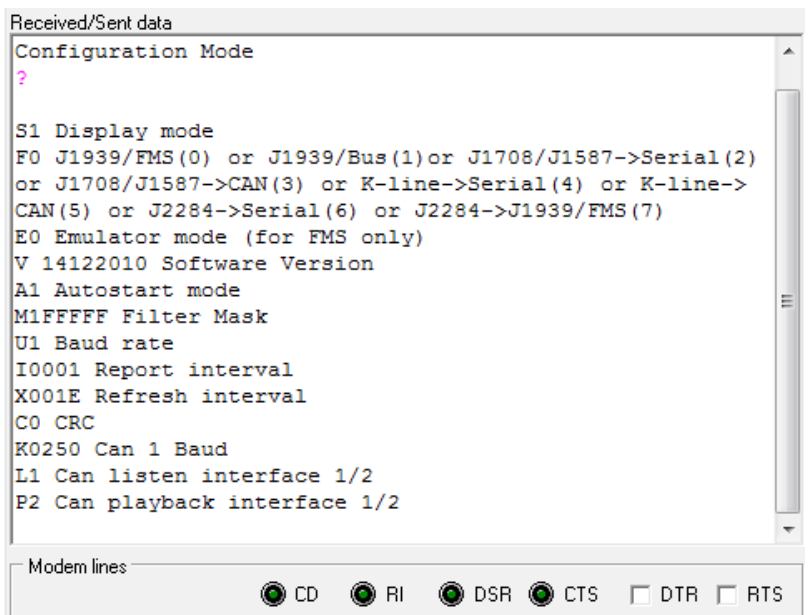
```
[BELL][CR]
?[CR]           - in order to get the actual configuration
Command_1
Command_2
.....
.....
Command_n
?[CR]           - in order to verify the actual configuration
R[CR]
```

5.3 ? Command – show parameters

Displays the actual parameter setting

Format:
?[CR]

Answer:
Parameter set
Error message on wrong command format
Output format (default factory settings):



```
Received/Sent data
Configuration Mode
?
S1 Display mode
F0 J1939/FMS(0) or J1939/Bus(1) or J1708/J1587->Serial(2)
or J1708/J1587->CAN(3) or K-line->Serial(4) or K-line->
CAN(5) or J2284->Serial(6) or J2284->J1939/FMS(7)
E0 Emulator mode (for FMS only)
V 14122010 Software Version
A1 Autostart mode
M1FFFFFF Filter Mask
U1 Baud rate
I0001 Report interval
X001E Refresh interval
C0 CRC
K0250 Can 1 Baud
L1 Can listen interface 1/2
P2 Can playback interface 1/2

Modem lines
  ● CD   ● RI   ● DSR  ● CTS  □ DTR  □ RTS
```

5.4 A Command – Autostart mode

Set the autostart mode.

Format:

An[CR]

n = {0 | 1}

Answer:

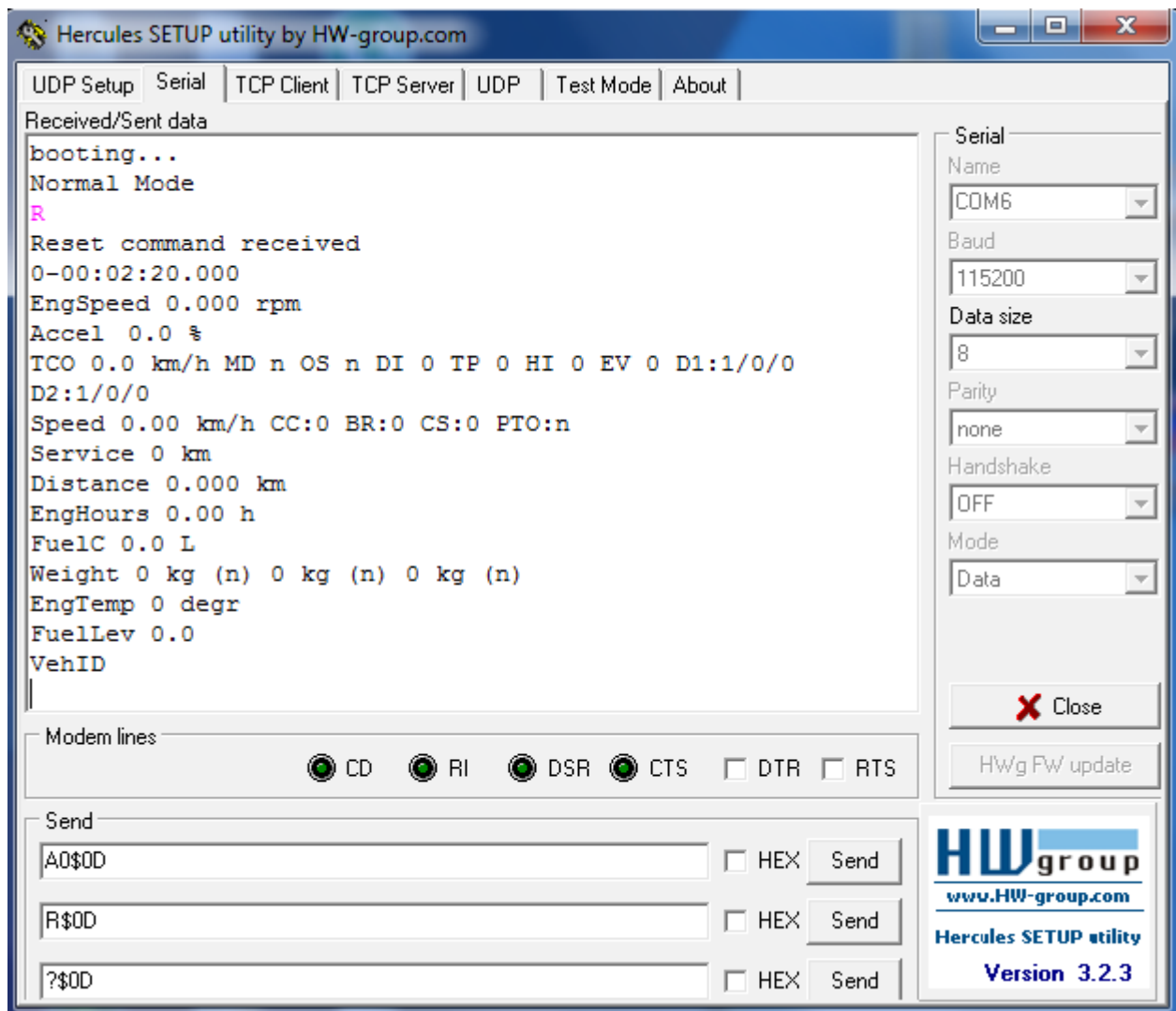
AUTOSTART command received[CR][LF] if command is accepted

When n=1 the chip will transmit the information immediately after startup.

When n=0 the chip will wait for R[CR] – in order to start

or [BELL][CR] – in order to configure.

Example using Hercules:



5.4 M Command – mask for output values

The M command sets the mask for the FMS messages involved in output values. Acceptable parameter range is between 1 and 1FFFFFF. Value has to be inputted in hexadecimal notation.

Format:

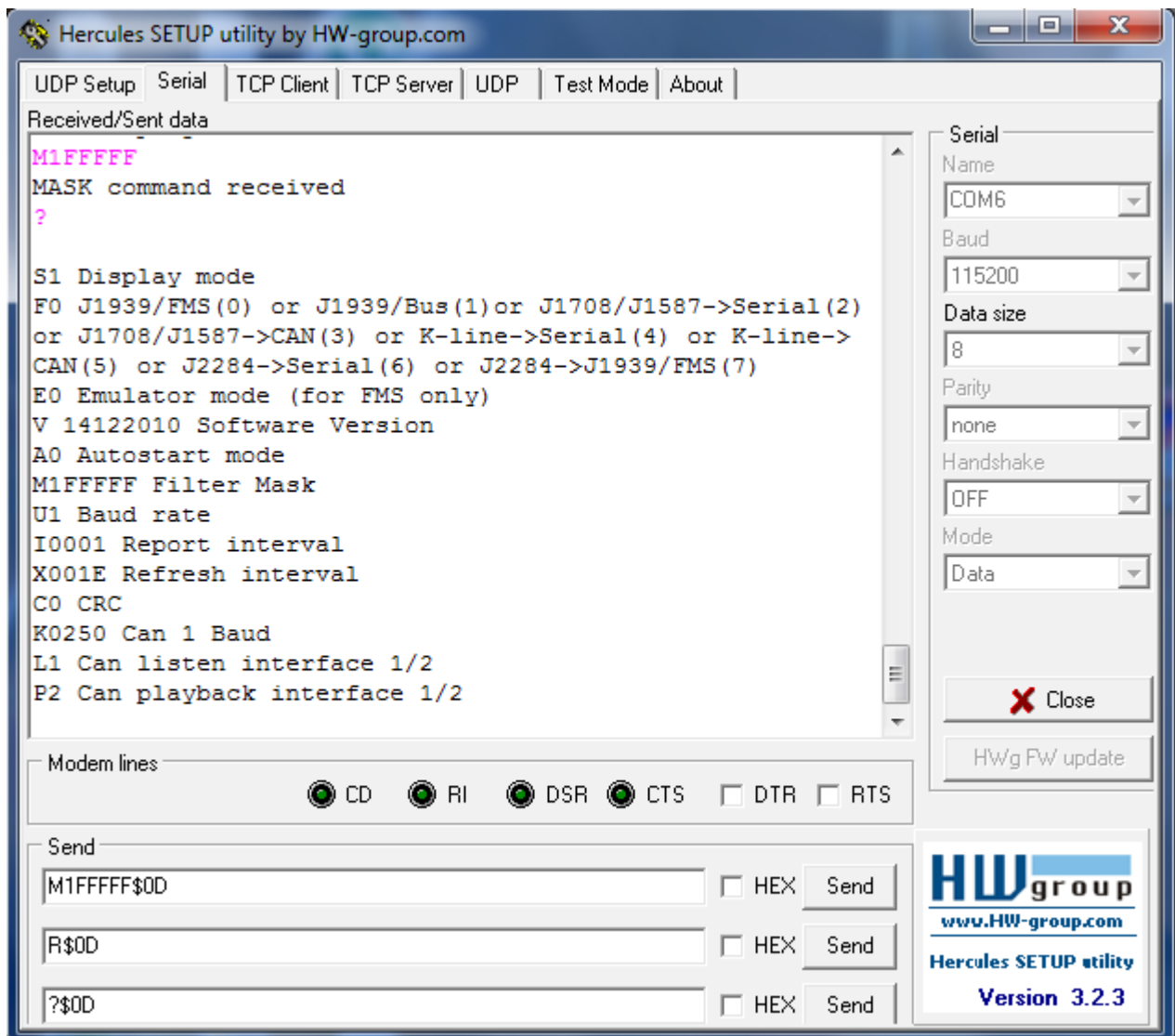
Mcccccc[CR] with ccccc = mask register (6 hexadecimal digits).

Answer:

MASK command received[CR][LF] if the value is accepted.

Error message on wrong parameter value or command format.

Example using Hercules:



In the mask register the bits related to the desired output messages has to be set to '1'. If a value should not appear in the output the related bit has to be set to '0'.

When CANGO is in J1939/FMS protocol mode with M1FFFFFF all messages are enabled for output.

Bit	7	6	5	4	3	2	1	0
J1939/FMS	Fuel Consumption	Engine Hours	Vehicle Distance	Service Distance	CCVS	TCO	Accelerator pedal	Engine Speed
J1939/Buses FMS	Fuel Consumption	Engine Hours	Vehicle Distance	Service Distance	CCVS	TCO	Accelerator pedal	Engine Speed
J1708/J1587	Fuel Consumption	Engine Hours	Vehicle Distance	not defined ¹⁾	Wheel Based Speed	not defined ¹⁾	Accelerator pedal	Engine Speed
K-LINE	Fuel Consumption	Engine Hours	Vehicle Distance	not defined ¹⁾	Vehicle Speed	not defined ¹⁾	not defined ¹⁾	Engine Speed
J2284 (Renault)	Fuel Consumption	Engine Hours	Vehicle Distance	Service Distance	Vehicle Speed	not defined ¹⁾	Accelerator pedal	Engine Speed

Bit	15	14	13	12	11	10	9	8
J1939/FMS	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	FMS Version	Vehicle ID	Fuel Level	Engine temp	Vehicle Weight
J1939/Buses FMS	Door Control2	Door Control1	Gear	not defined ¹⁾	Vehicle ID	Fuel Level	Engine temp	not defined ¹⁾
J1708/J1587	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	Fuel Level	Engine temp	not defined ¹⁾
K-LINE	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	Vehicle ID	not defined ¹⁾	Engine temp	not defined ¹⁾
J2284 (Renault)	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	Vehicle ID	Fuel Level	Engine temp	not defined ¹⁾

Bit	23	22	21	20	19	18	17	16
J1939/FMS	reserved ¹⁾	reserved ¹⁾	reserved ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾
J1939/Buses FMS	reserved ¹⁾	reserved ¹⁾	reserved ¹⁾	Ambient Temp	Fuel Economy	Alternator Speed	Air Supply Presure	Air Suspension Control
J1708/J1587	reserved ¹⁾	reserved ¹⁾	reserved ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾
K-LINE	reserved ¹⁾	reserved ¹⁾	reserved ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾
J2284 (Renault)	reserved ¹⁾	reserved ¹⁾	reserved ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾	not defined ¹⁾

1) 'reserved' and 'not defined' bits has to be set to '0'

5.5 S Command – screen format

The S command sets the format of the serial output.

S0 sets the spreadsheet format for output. All values are separated by the ';' character and are outputted in one line beginning with the prefix and the time stamp.

S1 sets readable format where each PGN from the FMS standard is shown each on its own line and each value is preceded by its name, then followed by its unit if applicable.

Format:

Sn[CR]

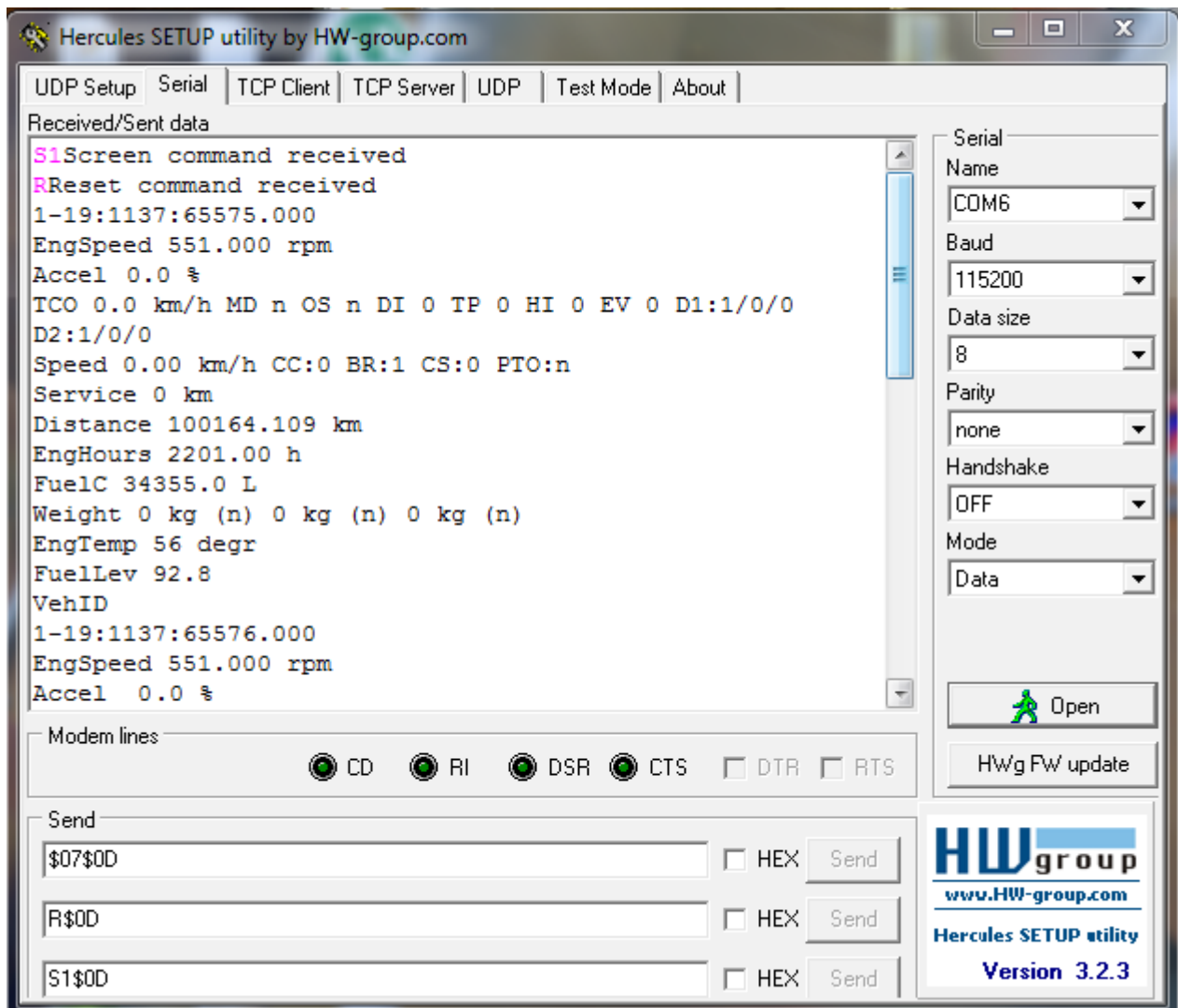
n = { 0 | 1 }

Answer:

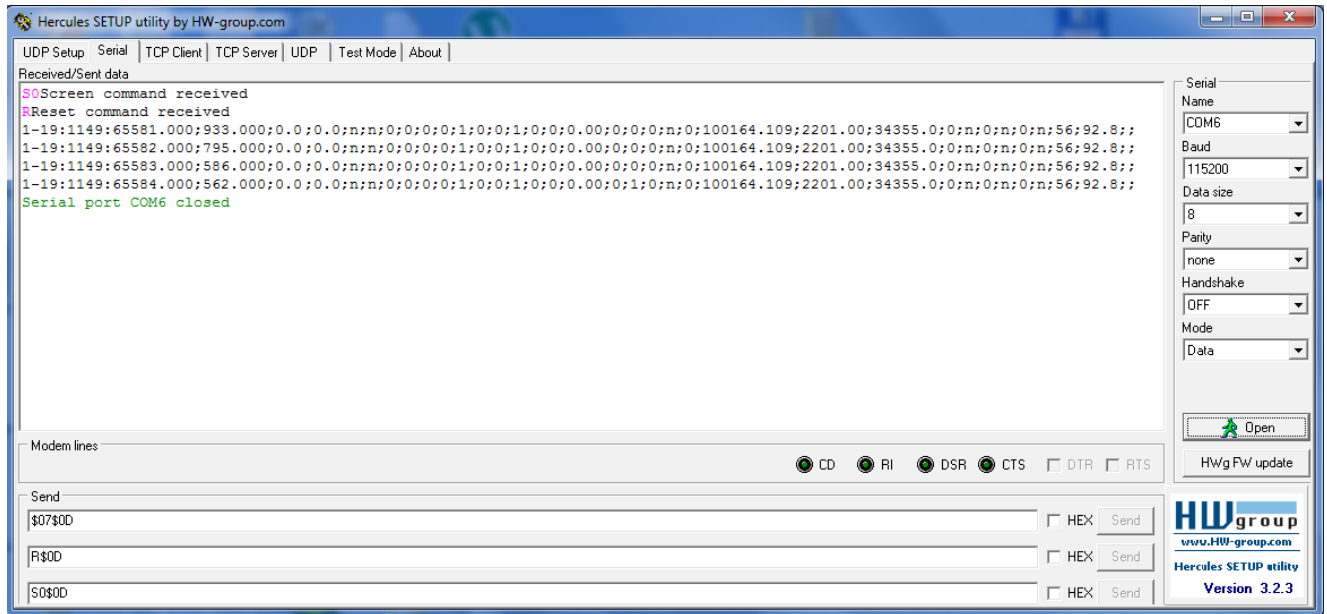
Screen command received[CR][LF] if command is accepted

Error message on wrong parameter value or command format

Example using Hercules for S1 setting:



Example using Hercules for S0 setting:



5.6 F command – sets operating protocol

The F command enables you to choose between J1939/FMS Truck, J1939/Buses FMS, J1708/J1587, K-Line or J2284 protocols.

F0 sets the J1939/FMS Truck working protocol.

F1 sets J1939/Buses FMS working protocol.

F2 sets J1708 working protocol with output on serial port.

F3 sets J1708 working protocol with output on CAN port using J1939/FMS.

F4 sets K-Line working protocol with output on serial port.

F5 sets K-Line working protocol with output on CAN port using J1939/FMS.

F6 sets J2284 working protocol with output on serial port.

F7 sets J2284 working protocol with output on CAN port using J1939/FMS.

Format:

Fn[CR]

n = { 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 }

Answer:

FMS command received[CR][LF] if the command is accepted

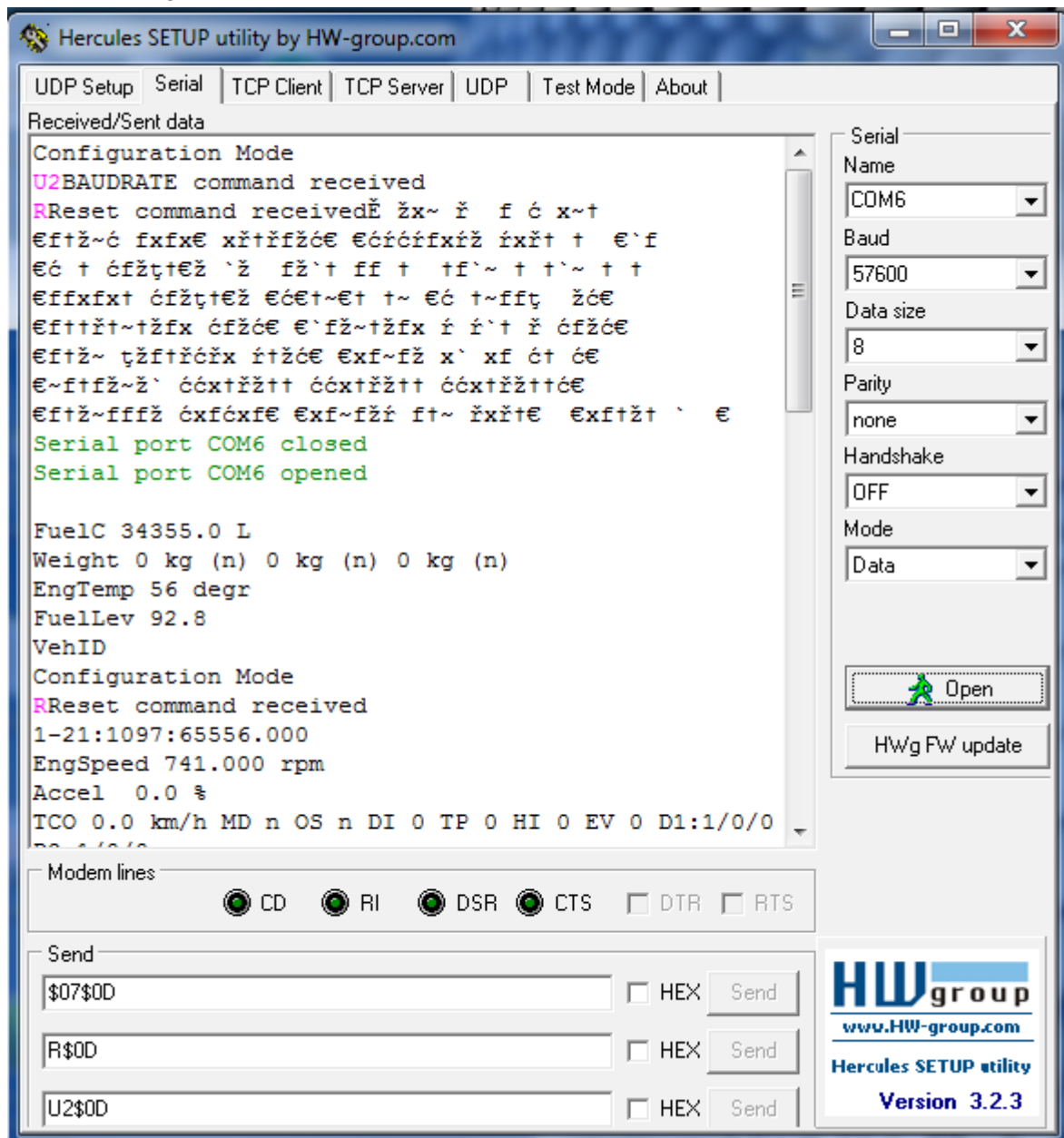
Error message on wrong parameter value or command format

5.7 U Command – UART baud rate

The U command sets the baud rate of the serial link. The answer is given with the old baud rate and the baud rate is switched immediately after the Reset Command. The old baud rate remains active until the reset command. Answer: *BAUDRATE command received[CR][LF]*

Command	bps
U1	115200
U2	57600
U3	38400
U4	19200
U5	9600
U6	4800
U7	2400

Example using Hercules:



The screenshot shows the Hercules SETUP utility window. The 'Serial' tab is selected. The 'Received/Sent data' pane displays the following text:

```

Configuration Mode
U2BAUDRATE command received
RReset command received
FuelC 34355.0 L
Weight 0 kg (n) 0 kg (n) 0 kg (n)
EngTemp 56 degr
FuelLev 92.8
VehID
Configuration Mode
RReset command received
1-21:1097:65556.000
EngSpeed 741.000 rpm
Accel 0.0 %
TCO 0.0 km/h MD n OS n DI 0 TP 0 HI 0 EV 0 D1:1/0/0
  
```

The right-hand pane shows the serial port configuration:

- Serial Name: COM6
- Baud: 57600
- Data size: 8
- Parity: none
- Handshake: OFF
- Mode: Data

Buttons for 'Open' and 'HWg FW update' are visible. The bottom of the window shows modem line status (CD, RI, DSR, CTS, DTR, RTS) and a 'Send' section with input fields for '\$07\$0D', 'R\$0D', and 'U2\$0D', each with a 'Send' button and a 'HEX' checkbox.

5.8 V Command – version information

The V command gives in the software version information.

Format:

V[CR]

Answer:

V ddmmyyyy Software Version[CR][LF]

with *ddmmyyyy* representing the release date of software version.

Error message on wrong command format

5.9 I Command – up-date time to serial port

The I command sets the update period of time for output to the serial link. The default value is 1 second.

Format:

Icccc[CR]

Answer:

I command received[CR][LF]

with *cccc* = number of seconds of cycle time in hexadecimal notation (big letters only).

Error message on wrong command format

5.10 X Command – cycle time for CAN buffer

The X command sets the reset timer for incoming CAN messages.

This command was implemented because of different update time of CAN informations from truck manufacturers. This setting represents the time elapsed from the last CAN frame received in order to reset the parameters represented by that specific frame/PGN.

Format:

Xcccc[CR]

with *cccc* = number of seconds of cycle time in hexadecimal notation.

Answer:

X command received[CR][LF]

We recommend to use 30s update time for the CAN buffer (X001E).

Error message on wrong command format

5.12 C command – checksum mode

The C command sets the on/off the CRC algorithm. The output message in Spreadsheet Format contains CANbus data parts separated by the semicolon character (“;”). If the CRC algorithm is ‘on’, at the end of message there will be included a simple CRC character representing the sum of all previous characters divided by 256.

The CRC feature is available only in Spreadsheet Format (i.e. S0).

C0 sets the CRC algorithm ‘off’ – factory default setting.

C1 sets ‘on’ the CRC algorithm.

Format:

Cn[CR]

n = { 0 | 1 }

Answer:

C command received[CR][LF] if command is accepted

Error message on wrong parameter value or command format.

5.13 K command – CAN baud rate settings

The K command sets the CAN baud rate.

Format:

Knnnn[CR]

n={0010, 0020, 0050, 0125, 0250, 0500, 1000}

Command	CAN baud
K0125	125
K0250	250 (default)
K0500	500
K1000	1000

5.14 L command - Setting specific CAN interface to listen

The L command sets the CAN port number which will then be used to connect to CANbus for the listen only function.

Format :

Ln[Cr]

n={ 1 | 2 }, default is 1

Answer:

L command received[CR][LF], if the command is accepted.

5.15 P command- Setting specific CAN interface to play

The P command is useful only when the device is set to F3 or F5 or F7 operation mode. The command sets the CAN port number on which the J1939/FMS frames are being sent.

Format:

Pn[Cr]

n={ 1 | 2 }

Answer:

P command received[CR][LF], if the command is accepted.

5.16 GP command – Setting the Prefix for the spreadsheet format

The GP command is used to set the Prefix used in the spreadsheet screen format (S0). CANGO Telematic Interface is being delivered **with no prefix** pre-programmed (Not a single byte).

Format:

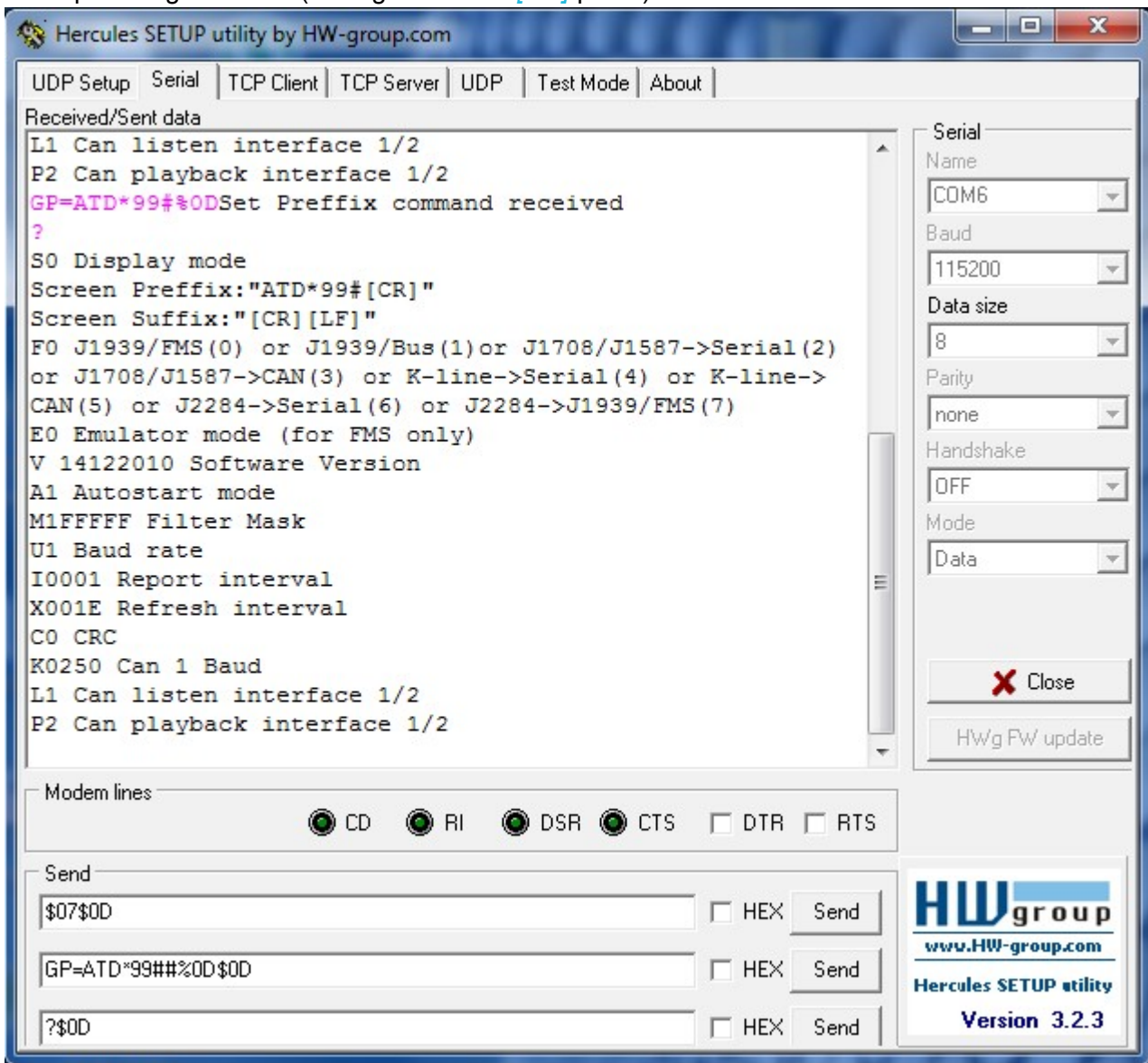
GP=*desired_ASCII_prefix*[Cr]

To use hexadecimal characters in the *desired_ASCII_prefix*, you should use the following format: %**XX**, where **XX** is the desired hex byte. If you need % (ASCII % character), then double it: %%.

You can verify the prefix that is being programmed into the Interface's memory by setting S0 screen format and by requesting actual configuration (?[CR] command) in configuration mode.

Note: Prefix and Suffix are used and showed in the actual configuration only in Spreadsheet Format (i.e. S0).

Example using Hercules (setting *ATD*99#[CR]* prefix):



Note: In Hercules for special characters #, \$, <, you have to double type them.

5.17 GS command – Setting the Suffix for the spreadsheet format

The GS command sets in the Suffix used in the spreadsheet screen format (S0). CANGO Telematic Interface is being delivered with the `[CR][LF]` suffix pre-programmed.

Format:

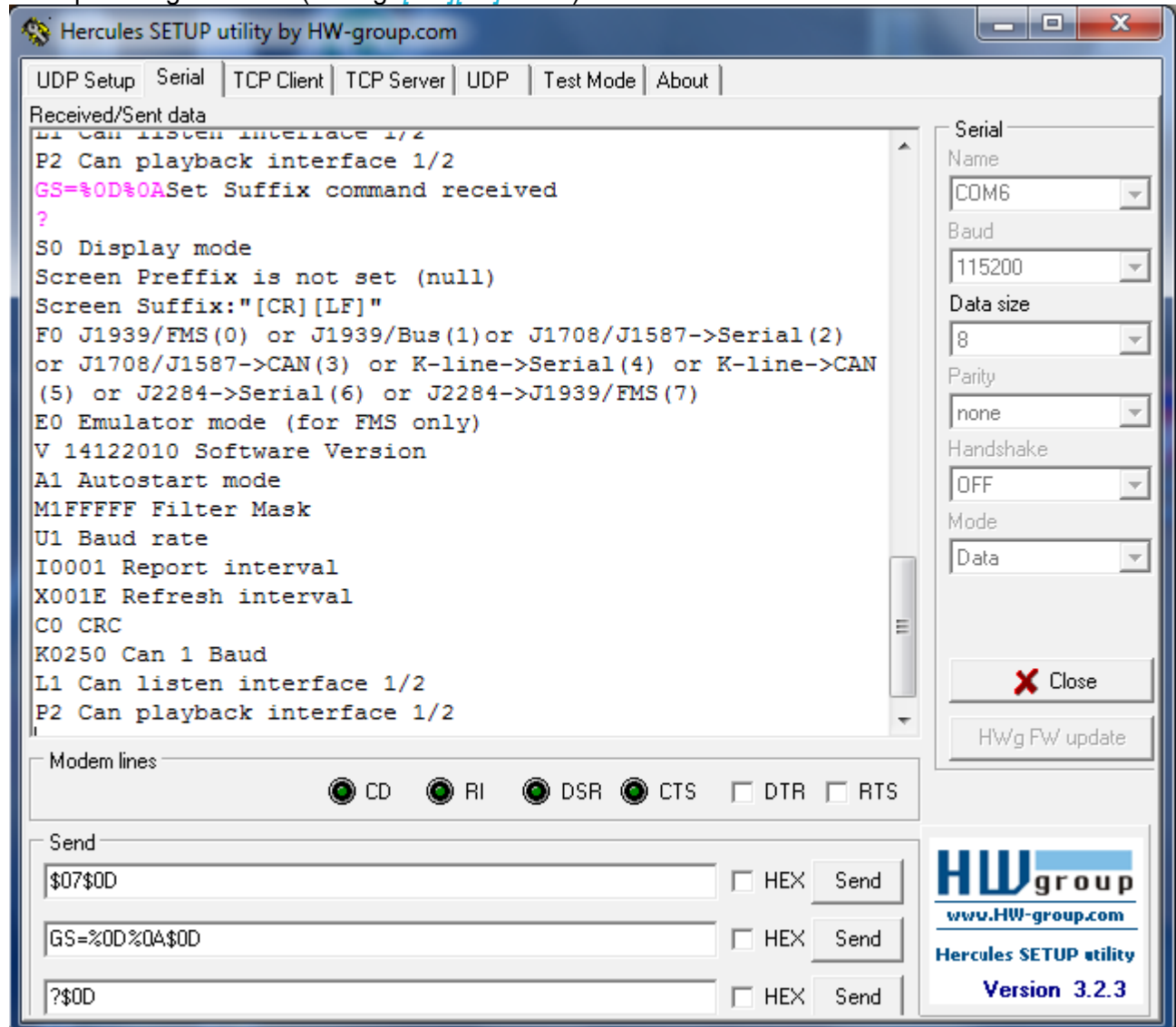
GS=*desired_ASCII_suffix*[Cr]

To use hexadecimal characters in the *desired_ASCII_suffix*, you should use the following format: `%XX`, where `XX` is the desired hex byte. If you need `%` (ASCII `%` character), then double it: `%%`.

You can verify the suffix that is being programmed into the Interface's memory by setting S0 screen format and by requesting actual configuration (`?[CR]` command) in configuration mode.

Note: Prefix and Suffix are used and showed in the actual configuration only in Spreadsheet Format (i.e. S0).

Example using Hercules (setting `[CR][LF]` suffix):



Note: In Hercules for special characters #, \$, <, you have to double type them.

5.18 JF command – Setting the Total Fuel Consumption Index

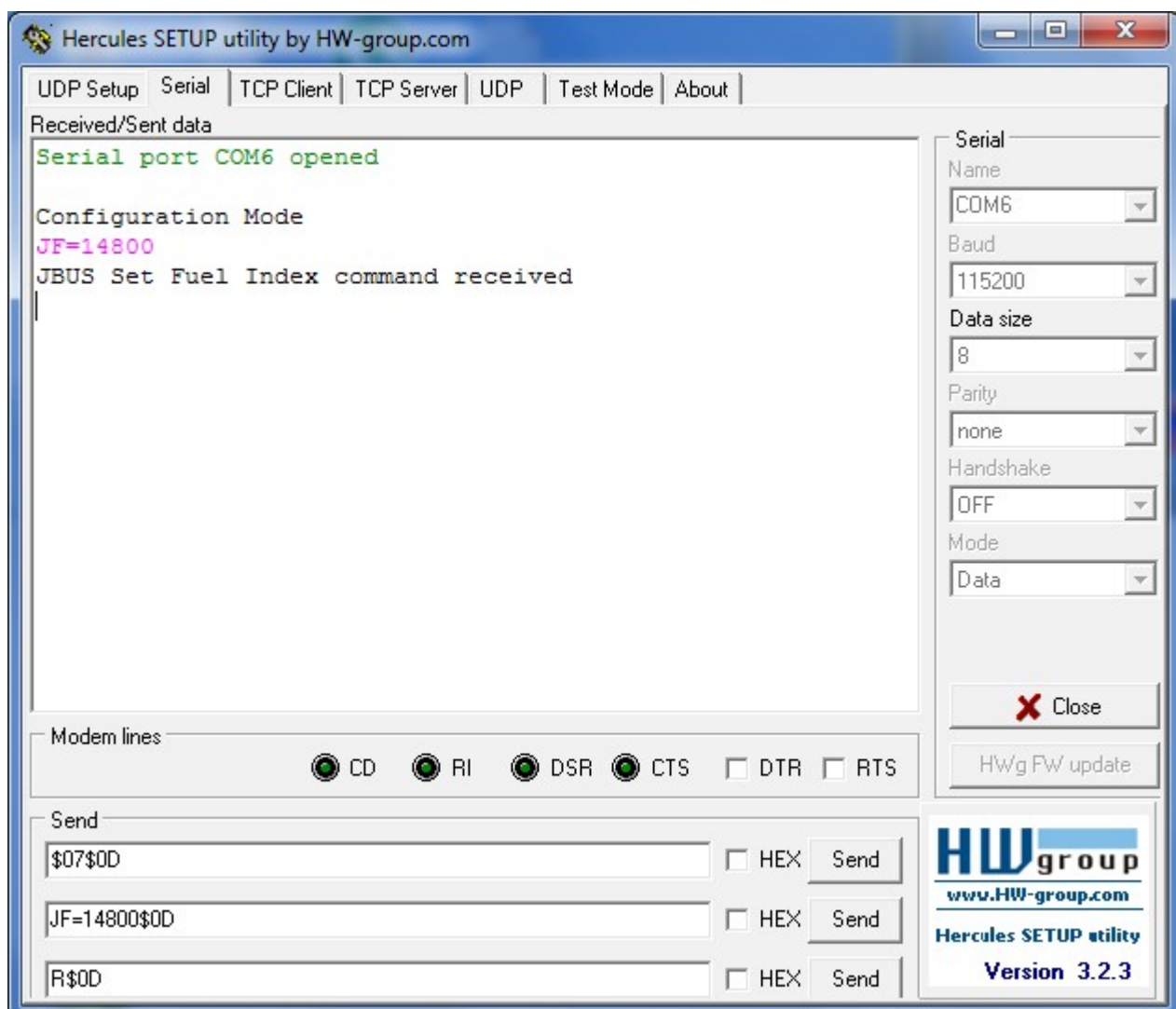
The JF command is used to set the Total Fuel Consumption Index¹⁾. CANGO Telematic Interface can automatically detect whether the locally stored Index or the global one that is transmitted on the network to be used.

Format:

JF=*dashboard_decimal_Index*[Cr]

The *dashboard_decimal_Index* value should be in decimal format and expressed in liters (digits from 0 to 9 accepted).

Example using Hercules (setting the Total Fuel Consumption Index to 14800 liters):



¹⁾ On some Volvo trucks the Total Fuel Consumption Index is being reset to zero with every engine start. Saving it into the Interface's non-volatile memory gives the possibility to have the Index initialized and maintained to the dashboard indication. The feature is available on both J1939 and J1708/J1587 protocols.

5.19 JD command – Setting the Total Distance Driven

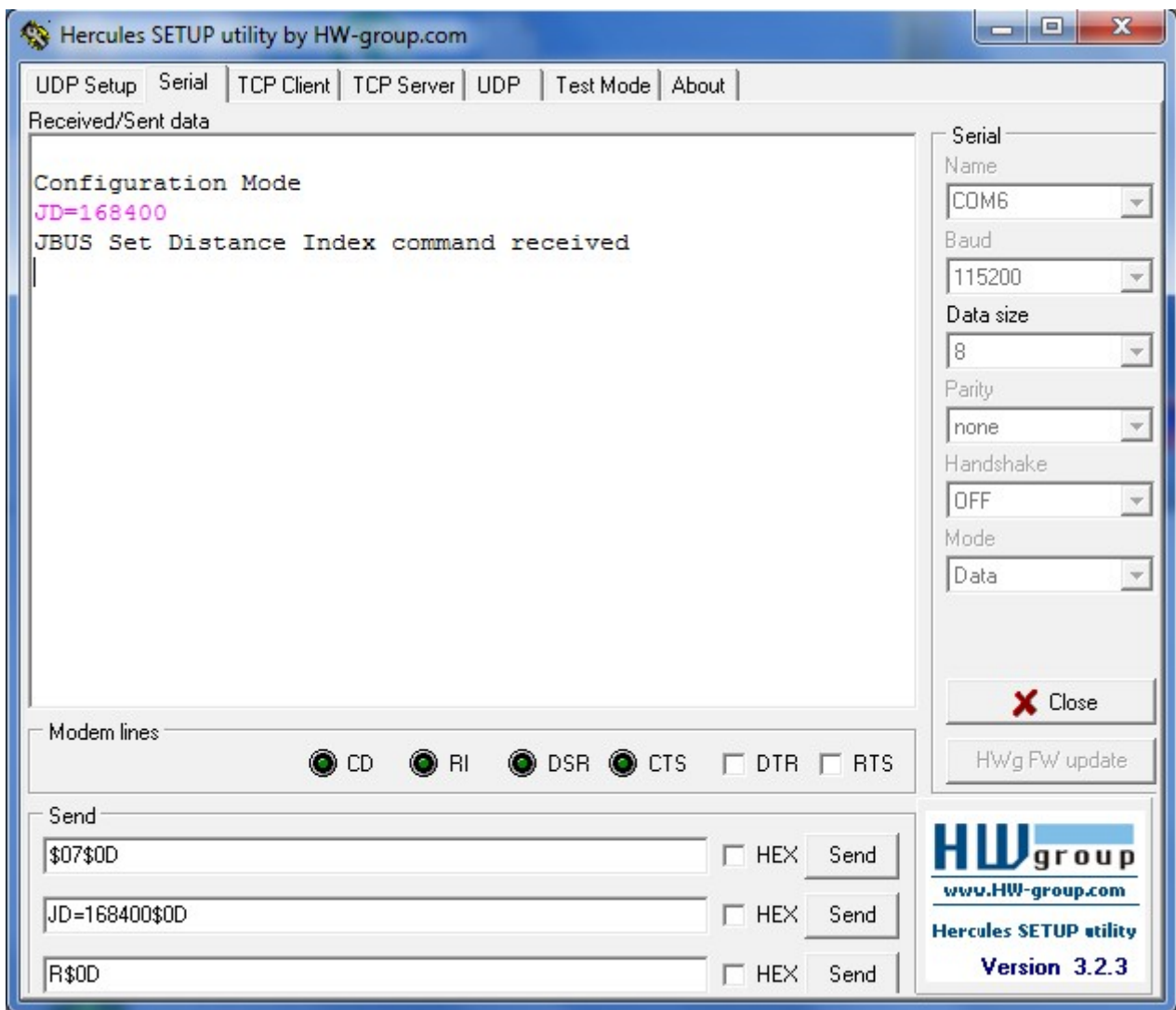
The JD command is used to set the Total Distance Driven¹⁾. CANGO Telematic Interface can automatically detect whether the locally stored Index or the global one that is transmitted on the network to be used.

Format:

JD=*dashboard_decimal_Index*[Cr]

The *dashboard_decimal_Index* value should be in decimal format and expressed in kilometers (digits from 0 to 9 accepted).

Example using Hercules (setting the Total Distance Driven to 168400 kilometers):



¹⁾ On some Volvo trucks the Total Distance Driven Index is being reset to zero with every engine start. Saving it into the Interface's non-volatile memory gives the possibility to have the Index initialized and maintained to the dashboard indication. The feature is available on both J1939 and J1708/J1587 protocols.

6. Operating mode

In normal operating mode you will encounter the situations described below:

1. F0 – the CAN channel is active, the received J1939/FMS messages are interpreted and the received values stored in an internal process image, or
2. F1 – the CAN channel is active, the received J1939/Buses FMS messages are interpreted and the received values stored in an internal process image, or
3. F2 – the J-Bus (J1708) channel is active, the received J1587 messages are interpreted and the received values stored in an internal process image, or
4. F4 – the K-Line channel is active, the received K-Line messages are interpreted and the received values stored in an internal process image, or
5. F6 – the CAN channel is active, the received J2284 messages are interpreted and the received values stored in an internal process image.

Afterwards the ASCII output for the serial link is then built up and sent either in a cycle period given by the I command and X command or if the data request command is received/activated (but only if cycleTime is set to FFFF using the I command).

The output is given in the format defined by the ScreenFormat parameter.

Only parameters marked with a 1 bit in the M command are included.

In case you need J1939/FMS output, the following possible situations are described below:

6. F3 – the J-Bus (J1708) channel is active, the received J1587 messages are interpreted and the received values are stored in an internal process image, or
7. F5 – the K-Line channel is active, the received K-Line messages are interpreted and the received values are stored in an internal process image, or
8. F7 – the CAN channel is active, the received J2284 messages are interpreted and the received values stored in an internal process image.

The data is then being sent like J1939/FMS frames protocol on the CAN port specified by P command. Special care should be given to F7 mode. The listen CAN port and the playback CAN port should be different. Default is L1 (listen on CAN1 port) and P2 (playback on CAN2 port).

6.1 Output Formats

The output can be formatted in two ways.

The following chapters will explain formats and variables.

6.1.1 Screen format (S = 1)

When S1 mode is configured, the output is set to readable 'screen format' with variable names and physical units. See below the output for the default mask (M1FFFFFF) in Truck protocol mode (F0).

Truck FMS Protocol

IdentifierString

0-00:11:56.961

EngSpeed 2725.125 rpm

Accel 51.2 %

TCO 78.12 km/h MD:1 OS:0 DI:0 TP:0 HI:0 EV:0 D1:1/3/1 D2:0/2/7

Speed 78.12 km/h CC:1 BR:0 CS:0 PTO:1

Service +3205 km

Distance 45342.125 km
 EngHours 975.05 h
 FuelC 9839.0 L
 Weight 1000.0 kg (n) 2000.0 kg (n) 3000.0 kg (n)
 EngTemp +71 degr
 FuelLev 60.4 %
 VehID CANGO
 FMS 01.00 Diag:0 Requ:0

6.1.2 Spreadsheet Format (S = 0)

When S0 mode is configured, a reduced spreadsheet format without any variable names and units is selected. All numerical values are separated by the ';' character. One line holds all values selected with the mask command. Similar to the screen format all variables with special meaning or that are not available are marked with the characters 'n', 'e', 'o' or '*'. The line is terminated by the Suffix (GS command, [CR][LF] is default).

6.2 J1939/FMS protocol

FMS variables

6.2.1 Time information

The first line in the S1 mode represents the time information in the format d-hh:mm:ss.ms. Milliseconds are given with three digits. Time measuring starts with 0-00:00:00.0 on powering up CANGO Telematic Interface.

Information for the day is incremented every 24 hours one by one up until 65535.

6.2.2 EngSpeed – engine speed

The second line in S1 mode shows the engine speed. The measurement unit is rpm (rotations per minute), resolution is 0.125 rpm.

6.2.3 Acc – accelerator pedal position

The third line shows the accelerator pedal position in % with a resolution of 0.4%.

6.2.4 TCO – tachograph information

Line 4 contains the information given by the tachograph. The first value is the speed information in km/h with a resolution of 1/256 km/h. The other informations are:

sign	Value	meaning
MD	0 or 1	motion detected (1: yes, 0: no)
OS	0 or 1	overspeed detected (1: yes, 0: no)
DI	0 or 1	direction (0: forward, 1: reverse)
TP	0 or 1	tachograph performance (1: analyze, 0: normal)
HI	0 or 1	handling information (1: yes, 0: no)
EV	0 or 1	tachograph event (1: yes, 0: no)
D1	0 or 1	driver 1 information (1: present, 0: absent)
	0..5	working state (see table below)
	0..13	time state (see table below)
D2		driver 2 information (same as driver 1)

Time state

0	Normal
1	15 min. bef. 4 ½ hours
2	4 ½ hours reached
3	15 min. bef. 9 hours
4	9 hours reached
5	15 min. bef. 16 hours
6	16 hours reached
7..13	Rez

Working state

0	Rest
1	Available
2	Work
3	Drive
4..5	Rez

6.2.5 Speed – wheel based speed

The line marked with speed shows the wheel based speed in km/h with a resolution of 1/256 km/h. It also shows information about:

- Clutch switch (CS),
- Brake switch (BR),
- Cruise control (CC),
- Power Take Off device (PTO)

For CS, BR and CC 0 means not pressed or inactive, 1 means pressed or active.

Concerning PTO state the FMS standard defines only the values 0 (off/disabled), 5 (set) and 31 (not available). CANGO FMS interprets the received values according to SAE J1939-71 and the output values are set between 0 and 19 as numerical values if the truck supports it. For values between 10 and 30 CANGO FMS outputs 'o' and for the value 31 'n'.

6.2.6 Service – service distance

Service shows the service distance in km with a resolution of 5 km. The range is between -160635 and +160640 km.

6.2.7 Distance - vehicle distance

Distance shows the total vehicle distance in km with a resolution of 5 m.

6.2.8 EngHours - engine time

EngHours shows the total engine time in hours with a resolution of 0.05 h.

6.2.9 FuelC - fuel consumption

FuelC gives the accumulated fuel consumption in l (liters) with a resolution of 0.5 l.

6.2.10 Weight

The line 'Weight' gives the axle weights with the number of wheels per axle. The information is given for the number of axles defined in parameter 'axle count'. The axles order is front to backwards, the

weight is in kg with a resolution of 0.5 kg. Most truck manufacturers do not support the number of wheels. In these trucks CANGO outputs 'n' (not supported).
Axle weight messages are only supported with Truck FMS protocol.

6.2.11 EngTemp - cooling temperature

EngTemp gives the engine coolant temperature in Celsius degree with a resolution of 1 degree.

6.2.12 FuelL - fuel level

FuelL shows the fuel level in % with a resolution of 0.4%.

6.2.13 VehID - vehicle ID

VehId shows the identification string of the vehicle. According to SAE J1939-71 ASCII strings are terminated by the character '*'. CANGO FMS doesn't output the character '*'.

6.2.14 FMS – FMS version

This line shows the version of the implemented FMS standard in the form vv.rr where vv is the two digit version number and rr is the two digit revision number.

Diag announces if the FMS implementation supports diagnostic messages, Requ announces if the implementation supports requests.

6.3 J1939/Buses FMS protocol

The J1939/Buses FMS protocol has more information than Truck FMS, like: door status, fuel economy, etc.. Find the J1939/Buses FMS variables described below.

Example using S1 mode:

```

0-00:02:26.000
EngSpeed 550.000 rpm
Accel 0.0 %
TCO 0.0 km/h MD n OS n DI 0 TP 0 HI 0 EV 0 D1:1/0/? D2:1/0/?
Speed 0.00 km/h CC:0 BR:0 CS:0 PTO:n
Service -36070 km
Distance 90784.258 km
EngHours 2863.95 h
FuelC 29841.0 L
Weight 0 kg (n) 0 kg (n) 0 kg (n)
EngTemp 60 degr
FuelLev 100.0
VehID
FMS Diag:0 Requ:0
Gear: selected: -126,current: -126
Door control DC1: S:0,R/W:0,P:0
Door control DC2: E1:0,O1:0,L1:0;E2:0,O2:0,L2:0;E3:0,O3:0,L3:0;E4:0,O4:0,L4:0;
Air suspension control: FL:0.0,FR:0.0,RL:0.0,RR:0.0
Air supply pressure:Brake circ.1:1040 kPa,Brake circ.2:1048 kPa
Alternator Speed: A1:0,A2:0,A3:0,A4:0
Fuel economy: Rate:1.9,Instant:0.0
Ambient temp.: 27.875 degr
|

```

6.3.1 Time information

The first line gives the time information in the format d-hh:mm:ss.ms. Milliseconds are given with three digits. Time measuring starts with 0-00:00:00.0 on powering up CANGO Telematic Interface. Information for the day is incremented every 24 hours by one until 65535.

6.3.2 EngSpeed – engine speed

The second line shows the engine speed. Unit is rpm (rotations per minute), resolution is 0.125 rpm.

6.3.3 Acc – accelerator pedal position

The third line shows the accelerator pedal position in % with a resolution of 0.4%.

6.3.4 TCO – tachograph information

Line 4 contains the information given by the tachograph. The first value is the speed information in km/h with a resolution of 1/256 km/h. The other informations are:

sign	Value	meaning
MD	0 or 1	motion detected (1: yes, 0: no)
OS	0 or 1	overspeed detected (1: yes, 0: no)
DI	0 or 1	direction (0: forward, 1: reverse)
TP	0 or 1	tachograph performance (1: analyze, 0: normal)
HI	0 or 1	handling information (1: yes, 0: no)
EV	0 or 1	tachograph event (1: yes, 0: no)
D1	0 or 1	driver 1 information (1: present, 0: absent)
	0..5	working state (see table below)
	0..13	time state (see table below)
D2		driver 2 information (same as driver 1)

Working state

0	Rest
1	Available
2	Work
3	Drive
4..5	Rez

Time state

0	Normal
1	15 min. bef. 4 ½ hours
2	4 ½ hours reached
3	15 min. bef. 9 hours
4	9 hours reached
5	15 min. bef. 16 hours
6	16 hours reached
7..13	Rez

6.3.5 Speed – wheel based speed

The line marked with speed shows the wheel based speed in km/h with a resolution of 1/256 km/h. It also shows information about:

- Clutch switch (CS),
- Brake switch (BR),
- Cruise control (CC),
- Power Take Off device (PTO)

For CS, BR and CC 0 means not pressed or inactive, 1 means pressed or active.

Concerning PTO state the FMS standard defines only the values 0 (off/disabled), 5 (set) and 31 (not available). CANGO FMS interprets the received values according SAE J1939-71 and output values between 0 and 19 as numerical values if the truck supports it. For values between 10 and 30 CANGO FMS outputs 'o' and for the value 31 'n'.

6.3.6 Service – service distance

Service parameter shows the service distance in km with a resolution of 5 km. The range is between -160635 and +160640 km.

6.3.7 Distance - vehicle distance

Distance shows the total vehicle distance in km with a resolution of 5 m.

6.3.8 EngHours - engine time

EngHours shows the total engine time in hours with a resolution of 0.05 h.

6.3.9 FuelC - fuel consumption

FuelC gives the accumulated fuel consumption in L (liters) with a resolution of 0.5L.

6.3.10 EngTemp - cooling temperature

EngTemp gives the engine coolant temperature in degree Celsius with a resolution of 1 degree.

6.3.11 FuelL - fuel level

FuelL shows the fuel level in % with a resolution of 0.4%.

6.3.12 VehID - vehicle ID

VehID shows the identification string of the vehicle. According to SAE J1939-71 ASCII strings are terminated by the character '*'. CANGO FMS doesn't output the character '*'.

6.3.13 FMS – FMS version

This line shows the version of the implemented FMS standard in the form vv.rr where vv is the two digit version number and rr is the two digit revision number.

Diag announces if the FMS implementation supports diagnostic messages, Requ announces if the implementation supports requests.

6.3.14 Gear – transmission information

This information is only supported in Bus protocol. The selected (S) and current (C) gear are shown. Negative values are reverse gears, the value 0 means neutral and a value of 126 means park position.

6.3.15 Door Control 1: DC1

Status 2 of doors: Composite indication of all bus door statuses. Enabled means the bus doors are able to be automatically opened or closed.

Ramp/Wheel Chair Lift Position: Signal which indicates the actual position of the ramp / wheel chair lift.

Position of Doors: Signal which indicates the actual position of the doors.

S:

Status 2 of doors

00 = all bus doors disabled

01 = at least 1 bus door enabled

10 = error
11 = not available

R/W:

Ramp/Wheel chairlift

00 = inside bus

01 = outside bus

10 = Error

11 = not available

P:

Position of doors

0000 = at least 1 door is open

0001 = closing last door

0010 = all doors closed

0011-1101 not defined

1110 = Error

1111 = not available

6.3.16 Door Control 2: DC2

Status of all bus doors.

E1:

Enable Status Door 1

00 = Disabled

01 = Enabled

10 = Error

11 = Not available

O1:

Open Status Door 1

00 = Closed

01 = Open

10 = Error

11 = Not available

L1:

Lock Status Door 1

00 = Unlocked

01 = Locked

10 = Error

11 = Not available

E2:

Enable Status Door 2

00 = Disabled

01 = Enabled

10 = Error

11 = Not available

O2:

Open Status Door 2

00 = Closed

01 = Open

10 = Error

11 = Not available

L2:

Lock Status Door 2

00 = Unlocked

01 = Locked

10 = Error

11 = Not available

E3:

Enable Status Door 3

00 = Disabled

01 = Enabled

10 = Error

11 = Not available

O3:

Open Status Door 3

00 = Closed

01 = Open

10 = Error

11 = Not available

L3:

Lock Status Door 3

00 = Unlocked

01 = Locked

10 = Error

11 = Not available

E4:

Enable Status Door 4

00 = Disabled

01 = Enabled

10 = Error

11 = Not available

O4:

Open Status Door 4

00 = Closed

01 = Open

10 = Error

11 = Not available

L4:

Lock Status Door 4

00 = Unlocked

01 = Locked

10 = Error

11 = Not available

6.3.17 Air Suspension Control

This information is only supported by the FMS Bus protocol. The message supports the air suspension pressure with the 4 bellow pressure values: front axle left (FL), front axle right (FR, rear axle left (RR) and rear axle right (RR). The pressure is given in kPa with a resolution of 0.1 kPa.

6.3.18 Air Supply Pressure

This information is only supported by the FMS Bus protocol. It gives the air pressure values of the two service brakes. The values are given in kPa with resolutions of 8 kPa.

6.3.19 Alternator Speed

This message shows the states of up to 4 alternators. A value of '0' means alternator is not charging, '1' means alternator is charging. This information is only supported by the FMS Bus protocol.

6.3.20 Fuel economy

This information shows fuel economy made by the bus.

Fuel rate: Amount of fuel consumed by engine per unit of time. The values are given in L/h with a resolution of 0.05L/h per bit. The value is between 0 and 3,212.75L/h.

Instantaneous Fuel Economy: Current fuel economy at current vehicle velocity. The values are given in km/L with a resolution of 1/512 km/L per bit. The value is between 0 and 125.5km/L.

Additional comment:

Calculated values are given as indications, not as contractual values.

6.3.21 Ambient temp

Ambient Air Temperature: Temperature of air surrounding vehicle. The values are given in °C with a resolution of 0.03125°C per bit.

6.4 J1708/J1587 protocol

There are two output possibilities in J1708 protocol mode:

- serial output from J-Bus active channel, using F2 command;
- CAN output from J-Bus active channel, using F3 command.

6.4.1 J1708/J1587 to serial output

In this mode the J-Bus(J1708) channel is active, the received J1587 messages are interpreted and the received values are stored in an internal process image.

ASCII output for the serial link is built up and sent either in a cycle given by the I command and X command or if the data request command is received (if cycleTime is configured to 0xFFFF using I command).

Output is given in the format defined by the ScreenFormat parameter.

Only messages marked with a 1 bit in the M command are included.

The J1708/J1587 variables are described below.

6.4.1.1 Time information

The first line gives the time information in the format d-hh:mm:ss.ms. Milliseconds are given with three digits. Time measuring starts with 0-00:00:00.0 on powering up CANGO Telematic Interface. Information for the day is incremented every 24 hours one by one until 65535.

6.4.1.2 EngSpeed – engine speed

The second line shows the engine speed. Unit is rpm (rotations per minute), resolution is 0.25 rpm.

6.4.1.3 Acc – accelerator pedal position

The third line shows the accelerator pedal position in % with a resolution of 0.4%.

6.4.1.4 Speed – wheel based speed

The line marked with speed shows the wheel based speed in km/h with a resolution of 0.805 km/h.

6.4.1.5 Distance - vehicle distance

Distance shows the total vehicle distance in km with a resolution of 0.161 km.

6.4.1.6 EngHours - engine time

EngHours shows the total engine time in hours with a resolution of 0.05 h.

6.4.1.7 FuelC - fuel consumption

FuelC gives the accumulated fuel consumption in L(liters) with a resolution of 0.473L.

6.4.1.8 EngTemp - cooling temperature

EngTemp gives the engine coolant temperature in degree Celsius with a resolution of 1 degree.

6.4.1.9 FuelL - fuel level

FuelL shows the fuel level in % with a resolution of 0.5%.

6.4.2 J1708/J1587 to CAN output

In this mode the J-Bus(J1708) channel is active, the received J1587 messages are interpreted and the received values are stored in an internal process image.

The data is then being sent like J1939/FMS frames protocol on the CAN port specified by P command. Only the parameters listed on 6.4.1 paragraph are supported.

Disclaimers

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